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MAY 14, 1951

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NEWS DIGEST

DOMESTIC

New scheduled air coach will be requested by American Airlines from 5, with one flight daily in each direction on New York-Dallas-Los Angeles route, using 70-seat DC-6s. One-way fare will be \$410.

CAB has delayed effective date of new revised airline Regulation 291 to June 5, at request of Senate Select Staff Business Committee, outstaying role of high regulator courts. Other business has delayed the revision. Senate bill 291 holds the standards to three days a month between any pair of the largest cities, right trips to San Jose or between any pair of smaller U.S. cities.

Army Field Forces is negotiating with Pacer for a number of buses revised to the 125 hp Super Cub (G-21).

Shipments of complete civil planes came to 285,403-lb. airframe weight for February, totaling 339 aircraft, a 6-percent decrease from January. Civil transport backlog dropped from 395 in January to 158 in February. Civil plane exports shipped during February were 365 totaling 178,900 lbs., compared with 359 of 182,000 lbs. in January. Value of exports and parts in February was \$6.6 million. Military and civil aircraft plane employment in that month totaled 215,631, a 9-percent increase over preceding month; engine plane employs in February were 56,434, a 6-percent increase over January.

John R. Cantley, aviation pioneer and associate of the late Vincent Bendish, died in Marinville, Ind., on Apr. 29. He was 65 years old. Since 1946 he had been engaged in research and development, mainly as aircraft landing gear, for Bendix Products division of Bendix Aviation.

Boeing B-47A Stratojet flew 1425 mi from Wichita to Seattle in 2 hr. 38 min. at an average speed of 542 mph. Headwinds of 50-55 mph were encountered during the flight, which marked the first B-47 landing at Seattle.

Sundair GE Corp. is opening its research laboratories at Haverly, Ill., to cooperate with an idea for a new jet fighter prototype product. Requirements have not been projected by a patent application or patent process whose ideas are selected next steps to pursue. Six clear to use the inventions here of royalty.

But the idea may be sold elsewhere.

Covair B-36 was resumed by an Air National Guard F-1 during sunset maneuvers near Carlsbad, Calif., killing 12 crew members of the high bomber and the pilot of the fighter. The accident happened while the fighter was making a combat pass at the B-36 at high altitude. Four B-36 crew members perished to safety.

Questions on radio will be continued in new news of commercial pilot system. The FAA is adding a new feature to the new license it is denied that commercial there should be familiar with radio basic principles and procedures of radio equipment.

FINANCE

Chicago & Southern Air Lines has declared a 25-cent per share dividend payable June 15 to holders of record June 1.

Mid-Continent Airlines has declared a dividend of 25 cents per share payable on June 11 to stockholders of record on May 21.

Air Associates, Inc. reports a loss of \$5646 for the quarter ended Mar. 31, compared with a net profit of \$11,918 for the corresponding period last year. Sales for the quarter totaled \$2,517,590 compared with \$2,164,140 for the same time last year. Earnings at Mar. 31 were over \$30 million, although up over the \$4.6 million at Mar. 31, 1950.

INTERNATIONAL

Cruciform Aircraft Co., Actonville (CMAA) and Cruciform Co., Cruciform Aircraft International (CAI) have each ordered three new DC-6B airplanes from Douglas Aircraft, bringing total orders for the model to 161 and equating all airlines ordering to 31. CAI is a French passenger and freight carrier.

Rend Navy has ordered DHG Sea Vipers of weather two place radar equipped fighters in quantity for carrier service. The Sea Vipers, powered by a 3000-hp. static thrust DHG Ghost turbojet, has thin, moderately swept wings. It is a Vespene development.

Hindustan Aircraft Factory, Bangalore, India, is now producing DHG 2 dual control trainers, similar to the DHG Champion, but fitted with Blackburn C-450 Major engines. Initial order of 350 planes has been placed by the government. The factory has also started assembly of DHG Vespene jet fighters. Three completed are being tested.

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SIDELIGHTS

Air Force

Undersecretary McGee is back in Washington after inspecting 12 major AF installations and conferring with West Coast manufacturers on production problems.

Gen Douglas MacArthur returned his Consolidated, the future in the USAF. USAF studies command status of 3rd Air Division in England to 3rd Air Force which, under Maj. Gen. Lewis Johnson, assumes administration of all USAF in the UK. Also established is the 1st Air Division of SAC at Catterick, under Maj. Gen. Arthur J. Dill, formerly deputy commander of 7th AF, and under operational control of SAC, which reports to the U.S. Joint Chiefs of Staff.

USAF is expanding its present WAF force about 7 times. From 1960 on, and women to 44,000, by 1970. To meet this goal, Air Force will commit over 300 officers and about 1700 retired women per month starting June 1.

National Production Authority

A new weekly, Defense Production Report, a being published by NPA "to provide a better reference to official actions of the defense production system." Annual subscription is \$1.50, domestic, available from Dept. of Commerce, Govt. Printing Office, Washington, D.C.

Civil Aviation

Roosevelt Field will close in New York May 11. State Commerce Dept., Albany, under its latest Airport Map, is dropping closing 115 hours from New York.

RFC

All loan applications and transactions will be given "definite publicity," says RFC's new administrator, W. Stuart Humphreys. Secretary of RFC, James, including two loans to Korea, is being released by the Senate's Fullbright investigating subcommittee.

Military

An Force & Navy are working out a new form security code on publicly the airplane power ratings. In the past, some ratings and very modern estimates, often were officially established. Defense Dept., at request of Ireland government, is studying military operations at Keflavik Air Base. U.S. operations—Army, Navy, and USAF—will help Ireland carry out portions of the North Atlantic Treaty.

Congress

Senate Small Business Committee expects to pass Undersecretary McGee and Bag (Continued on page 72)



CHASE BY TRANSPORT—First flight view of the Chase XC-121A, an XC-300A fitted with four 5200-hp Pratt & Whitney JT47-GE-11 turbojets in twin pods, one pod under each wing. This first U.S. jet cargo transport has already taken off and landed within 600 ft.



SEEING EYE CANTERA—English Electric Canberra jet bomber has been fitted with camera for photo-reconnaissance duties under designation PR-1. The plane is listed with Keith Rayner as sole developer. USAF version to be built by Martin will be B-77A.

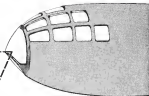
What's New in Military Aviation

FIRST IN IS DELIVERY—Two new Sikorsky three-place copiers for the Army Field Force are now in production on route to Ft. Rucker, N.C. A third is being flown in Wright-Patterson AFB for testing. The H-19 is fitted with a 245-hp Franklin engine and has a top speed of 110 mph and a heavy range of over 500 mi.

NORTH STAR—New French military cargo plane, the Nord 2501, on its first flight shows remarkable similarity to Fairchild twin-boom F-27. The 2501 is powered by two Bristol Hercules three-engine piston engines. The second prototype of the model, the first (N 2500) has two General Motors 148 engines at 400 hp each. The fuselage has a cargo capacity of approximately 1500 on ft. Note wing's unusually high aspect ratio.



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above the horizon—EICOR's electronic team supplies the only 100% AC power you can get during engine start for perfect flight-view under all flying conditions. Beyond the horizon—again the dynamic EICOR team provides the dynamic in closely controlled alternating current the power necessary to give vision in the first moments, the working days of your aircraft's motor and its associated equipment. You can be assured of the reliability of the vision your designed to light and starting. All Specifications, the EICOR 36Kva Alternator and Exciter Regulator have proven their dependability of performance over thousands of operational flying hours. The EICOR 36Kva Alternator will generate 314/304 volts, three phase, or 314 volts single phase, at frequencies of 300-7000 cycles and over a speed range of 200-10,000 rpm. Inverter voltage capabilities and full protection for the alternator is supplied by its own means, the EICOR electronic Exciter Regulator. This Exciter Regulator can also be used in any power circuit. The excitation supply, having a range, output characteristics output of 0-5 to 5.5 amperes DC and 14-0 to 170-0 volts D-C.



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WHO'S WHERE

Changes

Robert A. McMillan has been named assistant to George F. Hansen, director of Aircraft Industries, Army's planning section. He replaces **R. W. Marley**, by now with Ford Motor Co. McMillan will handle air research, procurement regulation, lend and test matters.

Garth W. Jones, formerly at Keesler Press, has joined Pacific Helicopters Corp. as treasurer, and **Paul L. Davis**, previously with General Aircraft Works, is now head of the company's industrial relations division. **Joseph D. Schmitt** has been made chief electronics engineer of Bell Air Corp.

Carl J. Lohy has been appointed general manager of the new Stratford plant being built for Canadian Food Improvement Ltd. in Stratford, Ontario, by the government to make jet engine turbine and compressor blades.

Ralph H. Leflow has joined Factor Applied Co. as staff engineer for aircraft fuel system components. **Victor O. Ray** has been named Pacific Coast district engineering representative for Westinghouse Electric Corp.'s Aviation department with head offices in San Francisco. **G. E. Campbell** has been appointed assistant works manager and **Donald A. Seiberlich** has been named industrial sales manager for Price Products division of Ray-Watson.

E. J. Felix has been promoted to industrial relations manager of the division. **H. Laird Cook** has been named assistant director of Republic Aviation's activities at Edwards AFB, Calif., flight test center. **R. L. Olinaga** has been placed in field as manager in the New York office of Wm. R. Whitaker Co. **William E. Romanus** has been transferred to the experimental division of Boeing's Seattle aircraft division, his former post as assistant production manager being filled by **Garold W. Katten**. **Donald J. Baber** was appointed a staff engineer to assist on administrative matters for Boeing.

David J. Kelly has been made manager of Lockheed's field office in Washington, D. C., replacing **Edmund O. Cassidy** who resigned in March. **George J. Bialek** will be named assistant mechanical sales and service manager for the Instrument Division of Thorne & Edison, Inc. **H. W. Thomas** has been assigned to the quality control division of Lockheed Aircraft's engine manufacturing division as assistant chief engineer.

W. B. Miller has been appointed assistant to the general manager of Kerm-Mfg. Co.'s Aircraft division. **Glenford Fisher** has been named factory superintendent of the division. **W. Robert (Boby) England** has been named director of sales for Coastal Airlines.

W. H. Miller has been named engine system operations director for American Airlines, succeeding **James G. Fries** who resigned in March to join Collins Radio. **Maxwell May** has been made sales manager for Pacific Northern Airlines.

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INDUSTRY OBSERVER

►Negotiations are now under way for a second CAA contract for the AG-1 experimental aircraft plant built under direction of Prof. Fred E. Weick at Texas A&M College Personal Aeronautics Research Center. New contract will cover modifications and tests required for certification. New contract will cover modifications and tests required for certification. New contract will cover modifications and tests required for certification. New contract will cover modifications and tests required for certification.

►EOAC has stopped using the better handbooks system supplied by Boeing on the British Isles' Stratosphere, to see whether there is any correlation between it and the fact that the empty weight of the plane has gone up 2000 lb. One theory is that the carbon lining of the plane has added up 2000 lb. of excessive loss the handbooks system.

►Explanation of the large increase in aerial photographic equipment requirements for the Air Force is in increased specialization of equipment. Separate gas cameras are needed for tracing machine guns and rocket fire because of different trajectories. New cameras are being provided to record pictures picked up on the scopes. Most thoroughly equipped reconnaissance plane, the Convair RB-36, will carry from 70 to 40 cameras of various types depending on its mission. USAF asked for \$63 million out of the fourth 1951 supplemental and the fiscal 1952 budget for a "down payment" on a total long-range photographic equipment program estimated at around \$953 million.

►The new McDonnell F3H Phantom Navy fighter has been called out of the McDonnell plant at St. Louis-Louisville and made its first test run. It is due for first flight any day now. Presently in the new Westinghouse J-40 and four turbojet, rated at over 7000 lb thrust dry and eventually, with afterburner, expected to get up to the 11,000 lb. mark or higher.

►Seven Navy F4U Corsair fighters (monoplane) of Air Force G-1191 have been referred to Hagerstown. They were purchased for training, looking-out modifications following the failure of a portion of the tail fin of one of the planes in flight. It was reported that the airplane on the ground was put into operation while the plane was at working altitude, resulting in an unusual stress on the tail fin, which failed.

►A new British North Atlantic F3H Phantom Navy fighter prototype now being developed is reported to have a speed of more than 500 mi/hr., approximately 600 mph.

►Naval Research Lab. has recently completed redesign of large-capacity fire extinguishing down systems on board U. S. carriers. Extinguishers will be portable remote control, and can be put into operation in 12 sec. Operation of the new system has already been battle-proven in the Korean area.

►Shell development engineers for potential airplanes in CAR, Part 3 are being charged to minimize the air reaction in effect prior to August, 1945, which specified landing angles on roll and yaw for stall test procedure. The change was made at a recent CAR hearing.

►First pre-production version of the new North American Navy swept-wing jet fighter F3D, developed from the earlier straight-wing F3H and the Air Force F-56, will probably be ready for its first flight within six months.

►The scheduled studies have renewed consideration of having fuel by weight instead of by volume. This would avoid conversion of gallons at various temperatures to that of standard conditions (W.F.) and conversion of gal. to lb. Switch would mean a change in measuring device, an expensive proposition.

House Group Slashes NACA 1952 Budget

National Advisory Committee for Aeronautics program for the 1952 fiscal year suffered a major setback when the House slashed over \$70 million off its budget—reducing it from the \$58 million recommended by Budget Bureau to less than \$60 million.

This would have left \$13 million below the \$63-million NACA has for the current 1951 fiscal year.

► **Changes**—There are the changes the House cut in the budget, now before the Senate Appropriations Committee, would bring about in NACA's program.

► **Personnel**. Instead of the 1206 now proposed NACA planned hiring to step up its activities to keep pace with the military development program, it would be limited to 693 new employees. NACA funds for administration were cut by \$4.5 million, from \$10.5 million to less. The agency has \$17.7 million for this year.

► **Construction**. All funds, \$13.5 million, for new research and development projects were eliminated. The \$11.7 million allowed will go toward completing contracts already let.

► **Reason for Cut**—The reason for the action NACA has failed to convince its congressional counterparts to continue to obtain authorization for its new construction projects from the Armed Services Committee before seeking funds for them. House Appropriations Committee has apparently restricted the agency's use of the money to allow it to follow the procedure followed by all other government agencies. This year the Appropriations and Armed Services Committees decided the time had come for a decision.

NACA still has funds available from the \$75 million appropriated for its phase of the United Windtunnel Program to move forward on three separate tunnels: 8.0 tunnels at Ames Laboratory and Lewis Laboratory, and a 4-ft. tunnel at Langley Laboratory.

These are the projects making up the certified \$17.1 million program allowed for the current year.

► **Langley Laboratory**, \$5.5 million, for modernization of the 7-ft. by 10-ft. tunnel and building additions to 16-ft. tunnel laboratory.

► **Ames Laboratory**, \$16.6 million, for modernization of the 8 ft. by 8 ft. tunnel and heat-transfer and low-density apparatus.

► **Lewis Laboratory**, \$18 million, for hydrogen hypersonic plant and high-altitude fuel facilities.

► **Wallops Island**, \$108,000 for new facilities.

► **Edwards Station**, \$4.3 million for flight test facility.



LOCKHEED LINE of jet trainers will step up to build new arm World War II

Busy Burbank

Lockheed offers new F-94 model; gets more orders for jet trainers.

A Lockheed proposal for a single-seat version of the F-94 jet fighter, to be designated F-94D, has been submitted by Air Force contract unit as the latest in the long list of major changes to the aircraft which originally started as the F-80 Shooting Star, but lost little resemblance now to its original version.

The proposed F-94D is designed as a long-range, ground support tactical fighter with additional fuel capacity taking the place of the main engine. It would use the same jet wing which is going into production on the F-94C and, possibly, the new powerplant, the Pratt & Whitney J-45 jet engine with afterburner.

Meanwhile Lockheed continues its work on the two- and four-engine versions with large additional 1952 orders for Air Force T-12 and T-20C. This will step up production on the airplane to the fastest rate and the largest total number for any Lockheed plane since the World War II two-engine piston fighters, the P-80 Lightning, which reached a production total of around 9000 fighters. The new version orders are in addition to fiscal year 1950 and fiscal year 1951 orders which totaled over 600, about 300 of which were for Navy.

To step up production on the 6000 jet trainers, Lockheed has set up a new fiscal assembly line in August formerly occupied by Aviation Main-

tenance Corp. at the Van Nuys, Calif., airport which is being used by Lockheed for flight testing of the newly completed T-33A and T-33C. Meanwhile the planes were completed at Burbank and then trucked to Van Nuys. Now Lockheed will truck the major assemblies and sub-assemblies to Van Nuys. In the final assembly, the cleaning and assembly work at Burbank, and simplifying the trucking problem.

Our Expanding Industry . . .

Pratt & Whitney Aircraft division of United Aircraft Corp. is expanding its subcontract program and this year expects to pay out \$250 million in subcontracts and supplies to subcontractors for new production. Some 90 percent of which are small business firms, 16,000 parts are subcontracted.

Food Motor Co. has been awarded a contract to build the Westinghouse J-40 jet engine. Engine will be produced by the Lincoln-Mercury division in a new plant. The J-40, developing approximately 7000-hp, thrust jet, is in production at Westinghouse's Kansas City plant.

Lockheed Aircraft Corp. purchases from both regular and subcontractors this year will be 127 percent higher than in 1950—up from \$132 million to an annual \$160 million.

North American Aviation, Inc. has subcontracted to Goodrich Aircraft Corp.'s Littlefield Park, Ark., plant the wing and empennage of the T-23 trainer. NAA will move tools from Downers Grove, Ill., to the new plant to start in June. Wings will be trucked to Downers for final assembly. Contract runs through 1952. Meanwhile, NAA has quickly moved into Plant No. 2 at St. Louis. Engine work is assigned by Pratt & Whitney to the company's New London, Conn., a major jet engine production of the FJ-1 Navy fighter.

General Electric Co. is tripling the capacity of its electronics laboratory at Syracuse, N. Y. The new plant will be increased from 35,000 sq. ft. to 101,000 sq. ft.

Ryan Aeronautical Co. workers have gone on a strike today to handle increased military aircraft contract. Ryan's production employees have been working 48 hours a week since November. Employment now a nearly 3000, with 300 more to be added in the next few months.

Boeing Aircraft Corp. has been loaned to manufacture aircraft parts at Shawnee, Okla. Maxwell Airport No. 3. President is H. C. Johnson, and vice president is M. F. Palmer.

American-Coleman Co., Omaha, Neb., has been awarded a \$3,900,000 contract by USAF for special purpose vehicles used in towing B-36 bombers.

U.S., Canada Blend Air Defense Efforts

The theme of North American air defense consists of a tight mesh of USAF and RCAF cooperation through all the levels of logistics, radar networks and aircraft performance.

Typical of this cooperation is the interchange of USAF and RCAF officers who observe, exchange techniques and know-how, and actually work in prohibited positions in both countries. For instance, the Canadian army for distribution, supply division, RCAF, in Wright-Patterson AFB, RCAF Squadron Leader C. F. Fitcham, who gives and takes in many orders in do U. S. officers in comparable positions, and whose decisions are put in looking on the USAF as an arm of American officials.

A good example of method agreement between the two nations is the training of North American Aviators F-51 Mustangs by Canada for pilot training and general building up of the RCAF. In the case, the Canadians are buying F-51 aircraft from the U. S., and in turn are selling on Kelly-Beyer Merit engine for the F-51. A further instance of the assistance is found in the maintenance of the NAA F-56 Sabre by Canadian. Canadian's private agencies also receive maintenance of parts, but the parts that are normally government-owned parts (GPP) will be supplied by USAF.

A further interesting arrangement is the RCAF-USAF Aviation Personnel. Of the 10,000 (POL) support personnel. Originally the RCAF had about 1000 personnel products available to the Air Force of both governments, was later expanded to include transfers to the Command of U. S. products and also to various civilian facilities. Now the account includes transactions between all the aircraft rather than being confined to the Air Force. According to a spokesman at Ottawa and Wright-Patterson AFB, various other adjustments made by the two agencies.

As regards the North American radar network, there is a tremendous exchange of drawings, procurement data and technical knowledge between the two countries in getting up the station. Military traffic through the station is readily properly handled. On the Northeast Staging Route, which runs from Great Falls, Minn. to Anchorage, there are three Canadian stations at Edmonton, Ft. Nelson, and Whitehorse, manned and operated by RCAF personnel using servicing equipment furnished by the U. S. in work on the American military traffic which is directed into the station.

Largely done cooperation between the two countries is resulting in what will eventually constitute one huge industrial and military machine.

"The One That Got Away . . ."

It happened at Tegel Airbase in the French sector of Berlin a week or two ago.

The big French base was rocked in with heavy big gun, road-squad and low hanging clouds.

Radar picked up a plane landing, and immediately the field that The French operations tower was alerted and an attempt was made to pick up the plane on Tegel's assigned radio frequency . . . No answer.

Suddenly out of the low-hanging clouds a jet Mustang, MIG-15, dropped, corded the field, landed the runway, headed down, and

climb began heading towards the operations room.

A radar-guided operations officer hurriedly dispatched a field director to wave the plane to the open below area and give him instructions.

J-35-A-23 Work Continues at Allison

The powerful new Allison J-35-A-23 turbofan engine which runs Air Force operations, have previously "put out of production" will continue its previous schedule for production as far as its original development, Allison division, General Motors Corp., is concerned, Aviation Week has learned.

Plans for putting in a J-35 A-23 into the Boeing B-47 bomber, as disclosed by Air Force Undersecretary John A. McCarty (Aviation Week, Aug. 10) are continuing. Allison is still going ahead on its own facilities contracts for the new engine's production, and it will probably be used as powerplant in most other new Air Force jet planes as well.

Because the production of the engine was being completely shifted, apparently once from the report that the new engine Boeing B-47C supplant had said its production would be delayed. This was the engine for which the J-35-A-23 engine had been originally planned.

Rescheduling of the B-47 program will push starting production of the very satisfactory B-47C up to place, thus postponing the B-47C testable. This is a substitution of the J-35-A-23 engines when they become available for the B-47C engine now used in the B-47C.

The Air Force expects to get advantage of some new power that the B-47C would have and this will be without losing production time in converting from the six-engine to the four-

times jet for chads under the which is not as possible.

The four engines will weigh about 10,000 lbs. in clear and clear and finally, as clearly as possible, signaled the pilot to exit engine. Apparently the Mustang pilot flew, and according to was put in for less time on the ground as it was in the air. He gained his engine, swung his plane 90 deg. to the right, made a hurried takeoff and down the steep take-off even though for a moment and disappeared into the clouds.

In a later, damaged, notification of the loss of the year's previous big, French authorities figured that the MIG-15 pilot had lost his bearings while setting Dr. G. W. Air Force in the Russian sector just a few miles southeast of Tegel.

engine configuration, Undersecretary McCarty has pointed out.

The delivery of the B-47C engines did reflect one setback on the actual plans for the J-35-A-23. Chevrolet division, General Motors Corp., which was planned, as a second source, to enter the engine at the big World War II aircraft engine plant at Tonawanda, N. Y., will not build the Allison engines there. Instead, Chevrolet is negotiating with Curtis-Wright for production of the B-47C engine for the Navy. This will mean that Helson Motor Co., which had been hoped as an alternate source for the B-47C, may not build its own engine plant planned for the B-47C production schedule.

It is understood that another second source for the J-35-A-23 is under consideration, and possibly will be designated soon. This will bring up the program to the larger dimensions it had before the Chevrolet switch.

Subcontractor Clinic

Small-business men who attended USAF subcontractor's clinic at Chicago Aug. 10-11, 12, and 13, reported to have come away with the idea that the Air Force is trying to give them their share of the defense production dollar.

A life-size count revealed that nearly 15,000 business men saw displays at some 38 major contractors during the Chicago show. Purpose of the exhibit was to acquaint small-business men with the needs of the great contractors.



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The "tail" you see above is an aluminum alloy strip being extruded by the biggest single piece of equipment in Alcoa's Research Laboratories. This precision-casting and metal-working machine can exert a force of three million pounds at a speed of 36 inches per minute. Yet Alcoa accounts control and measure its giant force with an accuracy of better than 1/4 of one per cent.

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PRODUCTION ENGINEERING



TABLE TOP MODEL of Willow Run plant shows Kaiser production sequence to lay out arrangement in detail. Every tool and part is in scale, and each is...



FITTED IN 10 PLACES and stuck in glue top with special adhesive. Then...



SECTION IS REMOVED in blueprint plan. This is a simple step when...



SECTION IS INVERTED. Outline of models shows through transparent grid sheet. Templates are laid over the outlines to prepare for interpreting (next page).

Toy Plant Speeds Kaiser Layout for C-119

Ingenious method of making blueprints gives engineers a floor plan only a few minutes' after arrangement.

A tabling procedure with toy-type, scale-model equipment is speeding a partial production switch from aircraft to Kaiser-Frazer's Willow Run plant.

Fast and careful planning was necessary of the full production schedule for the Fairchild C-119 aircraft now to be met. It meant readying more than one-third of Willow Run's own

to integrate KF's fabrication of the flying boxcar into plant facilities that have been turning out motor vehicles solely.

So KF production engineer E. M. Craig abandoned any conventional approach to the plant layout scheme and adopted a grid and miniature model arrangement that cuts a natural 600-inch and 150-inch planning ar-

gument to 2 in. cells and 60 men. **Square-Face Area**—The plant planning device is a game-size, three-dimensional table model of Willow Run, encompassing building structure, machinery, conveyor system and other installations under design to work together. The arrangement gives a bird's-eye view of what would normally be seen from a point about 600 ft above the spreading facility.

The completed layout will measure 70 ft long by 35 ft wide, scaled to

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Vibration Control Mountings
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GRID SHEET, with templates attached, is fed on standard blueprint paper and cut through in Chulid machine. Whole process takes only ten minutes.

It is, and will represent a speed of approximately 14 million sq ft, most of which is in the 80-acre main manufacturing building.

Forty-four openings, 6-ft square to 10-in support the duplex and can be rolled aside to permit planes to get to any part of the model layout. Each table is decked with an 2 x 1/8 plate upon which equipment models are placed.

Under each plate is a transparent grid sheet marked with black cross-hairs in 1/4-in squares, each a point on 1 sq ft of plant area.

Underneath the grid is a sheet of white Masonite which supplies the show-up comparison for the grid lines and disk equipment models.

Revelation Procedure—After optimum placement is arranged for the equipment models, which are stuck to the glass with a Masonite Mering & May Co. special adhesive, the plate is inverted over the open-top table. Over the bottom (now top) surface of the glass is placed the inverted transparent grid sheet.

The templates shaped to the cut lines of the machine bases are used directly over the model bottoms which stand out in dark contrast with lighting from below. Instead of templates, movable ground-penetrating may be used to define the bases directly on the grid sheet.

And one relevant information-off location, with location, etc.—may be given precisely at appropriate locations on the sheet.

Quick Plot—The blueprint grid with equipment outlines spotted in place it runs through an Chulid roller and in a few minutes a paper print of the layout is available. Changes

are simple. The model is removed and another print made.

The method of plant layout is simpler and more accurate than the one standard drawing board procedure. The grid scheme has previously been used by one or two other firms, but on a small scale. K-F is reported to be the first to apply it so extensively, and its production techniques predict that it is headed for standard plant engineering practice in the industry.

New Fairey Process For Integral Tanks

A novel and simple method of making integral fuel tanks is the subject of a British patent in the name of the Fairey Aviation Co. Ltd.

Basic wing structure is reinforced from normal construction; there are no internal wing treatments required, except possibly for splining small gaps at rib-joint junctions. The whole outer surface is then coated with a film of rubber which is either sprayed or brushed on. A thin film of powdered aluminum goes on top of this layer. A final coat of deep sand the surface and gives a smooth finish.

The patent specification states that this method can also be used with a wing that has been cut, and that any puncture or crack in the surface could be effectively sealed this way, thus eliminating the need for stitching.

An alternate method considers the use of a flexible mold to build the outer skin, here in the form of a sheet. Fibrous material is applied to the inner face of the sheet, and the mating part to be sealed is brought against it with pressure.

point of return



Point of return, the new fuel gauge, will for ground crews indicate a maximum fuel level and a point of return for the pilot. It is mounted on the instrument panel of the aircraft.

First of its kind, the gauge is a high-precision, low-weight rugged system. It is designed to handle a wide variety of fuel tank geometries.

Simmonds Aeroaccessories, Inc., Tarrytown, N. Y., is the manufacturer of the gauge. It is designed to handle a wide variety of fuel tank geometries.

Simmonds Aeroaccessories, Inc., Tarrytown, N. Y., is the manufacturer of the gauge. It is designed to handle a wide variety of fuel tank geometries.

Among the numerous planes currently flying with Simmonds gauges are Douglas DC-6, AD-1, 2, 3 & 4; Convair 440, Lockheed Constellation, McDonnell F2H-2, Chance-Vought F7U-3, North American AJ-1, Glenn L. Martin AM-1Q, Grumman F9F-8 and SA-16-CB.



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First in Electronic Fuel Gauging



Britain's Percival P.56



Italy's Fiat G.42

A Look at New Foreign Military Trainers

Approach varies, but low-wing layout, side-by-side cockpit seating and all-metal construction are favored.

These new military trainers have recently been announced by manufacturers in Australia, England and Italy. And although there is not much in common among them, they do seem to interesting examples of different design approaches to approximately the same problem.

Design features of the three include all-metal construction, side-by-side cockpit positions, and a low-wing layout. Engine horsepower start at 145 and go to 150, but size and performance are comparable. The three are:

- **Commonwealth CA-12**, manufactured by Commonwealth Aircraft Corp., Melbourne, Australia.

- **Percival P.56**, built by Percival Aircraft Ltd., Luton, England.
- **Fiat G.42**, a product of Fiat S.p.A., Genoa, Italy.

Percival's P.56 has been accepted as the new standard basic trainer by the Royal Air Force, but the G.42 and P.48 are still undergoing evaluation by their respective countries' air arms. Commonwealth CA-12—Australia's latest trainer was designed to Royal Australian Air Force specifications as a replacement for the de Havilland Tiger Moth, long the standard trainer for the British Empire. At the same time, the RAAF wanted to improve the performance of any Moth replacement to

the point where it would compare with the Wirraway, an Australian development of the North American N. A. 16. Instructor and pupil sit side-by-side under an extremely large canopy of clear glass. An optional third seat is located between and behind the two positions. Cockpit enclosure is pitiable in the worst of emergencies.

Central engine is a Pratt & Whitney Anzule Wasp Jr., but production engines will be the Commonwealth Coyota, a six-cylinder, 400-hp radial. The powerplant installation has been designed for quick change, and is attached to the fuselage at the firewall by four bolts. All of the plumbing and wiring lines have quick disconnect couplings.

• **Strecher Conquest**—The G.42 is built of 24S alloy in a semi-mon-

DUCTILE IRON A Revolutionary Metallurgical Development

DUCTILE IRON is a cast ferrous product which combines the present advantages of cast iron with many of the product advantages of cast steel.

No longer in the pilot-stage stage, this new material is now produced and sold on the basis of specifications. Not only are its individual properties exceptional, but so other com-

mon engineering material provides such a combination of excellent castability and fluidity, with high strength, toughness, wear resistance, and machinability.

Actually, "ductile iron" denotes not a single product, but rather a family of ferrous materials distinguished by graphite in the form of spheroids...

a form controlled, in a broad sense, by small amounts of magnesium. Presence of spheroids rather than flake graphite gives this new product a ductility that is unique among gray iron irons.

Four important types of ductile iron now being produced commercially are tabulated below.

REPRESENTATIVE MECHANICAL PROPERTIES OF COMMERCIAL SHAPES OF DUCTILE IRON

	Tensile strength, psi	Yield strength, psi	Elongation, per cent	BSI	Hard condition
A	50,000	35,000	22.0/2.0	210/200	As-cast
B	50,000	35,000	22.0/2.0	115/100	As-cast
C	50,000	35,000	22.0/2.0	140/100	As-cast
D	50,000	35,000	22.0/2.0	210/200	As-cast

A. Ferritic in structure. Provides good mechanical wear resistance.

B. Ferritic-ferritic in structure. Provides strength and toughness combined.

C. A fully ferritic structure usually obtained by short anneal at 1400° (A) or 1000° (B). Provides optimum machinability and maximum toughness.

D. Higher phosphorus content than preceding grades, also higher manganese. Provides high strength and stiffness, but only moderate impact strength.

SOME UNIQUE PROPERTIES OF DUCTILE IRON

1. Its elastic modulus, about 25,000,000 psi, is virtually unaffected by composition or thickness.

2. It can provide a chilled, carbide, abrasion-resistant surface supported by a tough ductile core. No other single material can combine these properties... its only disadvantage being a tough material coated with a hard welded overlay.

3. As-cast ductile iron of 35,000 psi tensile strength has the same machinability rating as gray iron with a strength of 45,000 psi.

4. Annealed ductile iron can be machined at a rate 2 to 3 times that of good quality gray iron.

5. It can be satisfactorily welded.

APPLICATIONS

Automotive, agricultural implements, oilfield and allied industries apply ductile iron, as-cast and heat treated, in components too numerous to detail.

Machinery, machine tools, guide shafts, pumps, compressors, valves and heavy industrial equipment such as mills and rolling mill bearings, valves in high strength and rigidity.

In scales of engine, furnace and other parts serving at elevated temperatures, it provides oxidation and growth resistance heretofore unavailable in high carbon castings.

Other applications include paper, textile and chemical machinery, marine equipment, and pipe.

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Exciter protection relay (Cover Removed)



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be installed to provide a maximum wing sweep from 145 to 260. Standard vertical slots in a Lycoming O-435 A six-cylinder cooled engine rated at 190 hp. A Pignoni 2-bladed, variable-pitch propeller is standard.

Fuel tanks are in the wings, one on each side of the fuselage, with a total capacity of about 45 gal.

The plane tests instructor and pupil side-by-side, with a third position for the observer, a full bubble type, shielded for armor and for emergency exit. The windshield frame is reinforced for over protection in case of a noseover or landing.

RAF standards apply to the cockpit.



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instruments, controls and instruments. The P-146 has an ultimate load factor of 13, substantiated by load tests. Wingspan of the craft is 36 ft 5 in., length, 27 ft 7 in. Wing area is slightly over 280 sq ft.

Empty weight of the P-146 is 3947 lb. Fully loaded, the two-place version weighs 5946 lb.

Maximum speed at sea level is 143.3 mph. Stalling speed is 45.5 mph. Time to climb to 7200 ft (3000 m) at 15 min 50 sec. Takeoff run in sea wind is 535 ft. Landing distance 492 ft. On full tank, the distance is just under 4 hr. payload range, including starting, stoppage, climb and climb is 415 mi.

Cockpit View vs. Screen Image

Researchers at the University of Illinois have been studying the feasibility of circumventing a pilot's windows and substituting a viewing screen for pilot guidance as the aircraft instrument panel.

Conducted by the university psychology department's Dr. Stanley N. Roscoe under sponsorship of the Office of Naval Research, the study was aimed at determining screen size and desirability of magnification.

Plans used were a Grumman T-40 fitted with a periscope. Windows and most of the instruments were covered so that the pilot had to depend on the periscope image for terrain data.

► First, freedom—during the tests the screen was blocked off to various sizes down to 2 sq inches. The periscope's optical system allowed for various degrees of magnification.

Eleven pilots flew the plane without the windows covered, then with the glass blocked out, using the various screen sizes and magnifications. A standard instrument flight pattern was used, which involved turning, climbing and gliding.

► Results—It was found that a pilot could fly with the five-square screen and low magnification giving a wide angle of outside visibility and about as well as with windows visible.

Smaller screens made the pilot's job more difficult. Image magnification is not desirable because it obscures the apparent size of any changes in the plane's movement and obscures the pilot.

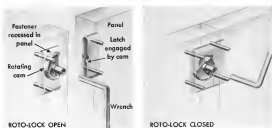
Roscoe suggests that for blind flying, where television or an optical system could not provide a view ahead, a periscope could be used. The pilot could be fixed on the screen and viewed about by a camera mounted just in front of the pilot's head. To give the pilot a horizon line and other visual reference points.

Blade Anti-Icing

A blade heating scheme for combating the ice hazard on the vital stages of tailpipe components has been developed at A. V. Roe Canada Ltd., Montreal, Ont.

The blade heating element is built up on a resin form. Resistance ribbon is wound on first, then insulated with glass-fibred ballbed windings. Concrete material is used to impregnate the assembly, which forms a core around which the blade is cast.

The resulting blade construction is reported to resist a high, constant rain-freezing water without reducing blade strength or disturbing internal contour of the propeller.



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MODIFIED CYCLONE 9 for Fairchild H21 is based on R-27 model (above)

Adapting Cyclones for Copter Use

Wright Aero reworks the 7 and 9 to meet specific operating characteristics of rotary-wing aircraft.

Wright Aeronautical Corp. is adapting two of its piston engines to meet the specific operating characteristics of rotary-wing aircraft.

Reworking of these engines—the Cyclone 9 and Cyclone 7—is considered by the company to be the most complete jet modification to ground engine powerplants for copter use, particularly in the case of the 7.

The copter version of the Cyclone 9 will be the R-1620-10, for the 7 it will be R-1180-1.

Power of 9 and 7—The reworked Cyclone 9, which successfully passed its

model tests in January, will be installed as a second piston engine in the Fairchild H21-2 Arctic rescue copter. It will be ready for delivery within the next few months. This engine, normally rated at about 1425 hp, will be used only in the H21 with about 1180 hp for sea level takeoff.

Reports are that the Cyclone 7 will go into the Sikorsky HO4S rescue copter—perhaps late this year. This copter now is powered by the Pratt & Whitney (600 hp, R-1140-50H), but this engine is not now in production. As far as can be determined, the 7 would use its full 900 hp for sea level takeoff.

Details of 9—in the 9, a hybrid with 7500 in.-w* moment of inertia was installed to furnish starting load in case of the wind gust. The hybrid also acted as a damper between the engine and the connecting shaft to the rotors. A cooling fan has been designed as part of the hybrid.

Power layout for connecting the engine to the shaft is by a three-rod clutch similar to a conventional governor, but the H21 installation will use a fluid coupling. This will be slowly filled with oil to make a gradual engagement of the rotors after starting.

Peculiar operating conditions of helicopters require that their engines run at much higher revolved speeds than those of fixed-wing aircraft. Thus, the Cyclone 9 will be required to operate at 2400-2600 rpm (close to its 2700-rpm takeoff speed) most of the time. Its cruise requirements call for 70 percent power or more, whereas conventional aircraft operate at a power setting well below that figure. The 9 has a two-speed supercharger.

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(3) Heat-Treat Cycle Test to determine hardening and draw characteristics of steel; (4) Thickness Tolerance Test to determine precise tolerance requirements.

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FASTEST THING IN FASTENINGS

point, remote engine air ingested in side at high altitudes. This calls for an altitude-sensitive side adjustment to maintain the enrichment of the fuel air mixture reaching from the "throat" of the air. The Cyclone 9 went through more than 200 hrs. of shakedown in the Wright plant in the total 450 hr. paid up so far. These included shakedown runs with a flywheel, in use of the nacelles of the company's B-17 power plant.

► **Problems With 7**—The Cyclone 7, not so far along as the 9, has posed additional problems. The powerplant will be an regular installation of approximately 35 deg., which necessitated complete redesign of the lubrication and vibration damping systems. Operating angles of the engine range from the 35 deg. ground position to about 45 deg. at maximum forward speed.

To cope with this condition, a large size pump for scavenging and pressure lubrication was added at the rear of the engine, with the first pump used for scavenging only.

Backer box scavenging at the front was enlarged by adapting of the pump from the much larger R-8190-20W and the engine engine was redesigned to be scavenged from all cylinders rather than the lower four in on the conventional plane engine.

Dynamic changes in the crankshaft, which showed a tendency to "head slap" at some of the engine angles position, was redesigned as a two piece arrangement.

Collector compression study for the Cyclone 7 is underway so that the engine, like the 9, will operate at side at high altitudes.

Flight Data Recorded For Immediate Use

A new test developed at Boeing Airplane Co. gives recorded flight data within immediately after the test plane lands.

A ten-page graphic device, it eliminates the data transcription delay associated with the usual method—penetration of pencil instrumentation as done in early tests with the X-47 Stratos.

The six-page card on a moving roll of graph paper 158 ft. long and capable of traveling at four speeds adjustable from 14 to 75 in. per min.

One of the pens marks off true trajectories. The others are linked respectively, to describe various flight factors: only at speed, angle of attack, normal acceleration, elevator position and hinge moments.

Boeing engineer Fred E. Wood developed the device with the assistance of flight test instrument design group's Willard Williams and Leslie Robinson.

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In 1866 the twin-jet F3D Skyknight was started down the production line at El Segundo, following enthusiastic reports from Navy test pilots.

Now being flight tested in preparation for line production is the A2D Skyhawk, turbo-prop attack plane. And above Edwards Air Base the rocket-powered D-558-2 Skyrocket is thrusting its needle-nose into the thin air, looking for scientific data that will help build newer type aircraft still in the classified status.

By carefully manipulating the design, development and production of these diverse power types, the Navy and Douglas have arrived at a flexible, "balanced power" position from which our air strength can be increased without delay. Douglas Aircraft Company, Inc.



ROCKET ENGINE delivers super sonic speed for Douglas "Skyrocket" (top)



TURBO-PROP ENGINE combines speed and endurance for Douglas A2D "Skyhawk" (center)



RECIPROCATING ENGINE gives pure jet thrust for Douglas F3D "Skyknight" (second)



RECIPROCATING ENGINE provides workable efficiency for Douglas AD "Skyraider" (bottom)



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NACA Reports

Charts for Estimating Downwash Behind Rectangular, Triangular and Trapezoidal Wings at Supersonic Speeds (TN 2145)—by R. C. Bueckler, 11 March and J. L. Coenegrave.

With these charts, aerodynamicists can estimate downwash behind wings in a supersonic medium. Choice of planform is limited to rectangular wings of reduced aspect ratios of 2, 4, 6 and 12, trapezoidal wings with reduced aspect ratios varying from 2 to 12.5, and taper ratios of 1:1 and 4:1, and triangular wings with reduced aspect ratios of 6 and 12.

(Reduced aspect ratio is the geometric aspect ratio multiplied by the cotangent of the Mach angle.)

(Only wings with supersonic leading and trailing edges were considered.)

The charts were obtained from lifting-line theory, they are applicable in regions behind the wing where the mixing-up of the trailing vortices sheet is not excessive.

Displacement and distortion of the trailing vortex sheet can be corrected by a procedure described in the Tech Note. And brief consideration is given to the case of the flapped wing.—DRA

The Calculation of Downwash Behind Wings of Arbitrary Plan Form at Supersonic Speeds (TN 2151)—by John C. Martin.

The present doublet method for determining the downwash flow behind wings has been developed into a form which gives approximate expressions for the downwash from lifting lines.

Applicability of the method depends on knowing the load distribution over the planform of the wing.

Results of the theoretical calculations are applied to a girding rectangular wing to find the downwash and the expansion for local angle of attack necessary to give a specified load distribution. These results are compared with those obtained from exact hypersonic theory and, for the particular case considered, agree within about 1 percent.—DRA

Further Experiments on Flow and Heat Transfer in a Heated Tapered Air Jet (Report 980—Stanley Combs and Melvin S. Uebel, Calif. Inst. of Technology).

Small but air jets are useful research tools with which to investigate heat transfer, boundary layer and turbulence phenomena. This report describes one such investigation at CalTech, sponsored by NACA.

Primary purpose of the CalTech



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study was to determine the effect of density difference on the rate of spread of the pest.

By measuring total head and true pressure fields in a round turbulent jet which had been heated to a variety of initial temperatures, the researchers found that the rate of spread increases with a jet density decrease with respect to the ambient medium.

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► **Line-Vertex Theory for Calculation of Supersonic Downwash** (Report 983) —by Harold Munk and Rudolph C. Munk.

Previous methods based on superposition or various distributions have had disadvantages, either in the applications to specific types of wings, or in the amount of work necessary to produce a solution.

This report had three major objectives: to derive and discuss the downwash field induced by a supersonic line source of constant slope, to examine the relation between the downwash field and a supersonic lifting surface and that induced by hot vortices, to present calculation methods for downwash and to compare the accuracy of these methods with exact laminar solutions.

A best lifting-line method is proposed for computing the downward field behind swept wings. In the spanwise case of triangular wings with numerous leading edges, this gave results that were in general in good agreement with the exact linearized solution. Un swept wings are attacked by an indirect lifting-line method (Boussinesq outer vortex). It was applied to the case of rectangular wings with aspect ratios of 2 and 4, and excellent agreement with exact linearized theory was shown for both aspect ratios. If the lifting-line were placed at the full-chord line, —D.A.

► **Wind-Tunnel Investigation at Low Speed of Lateral Control Characteristics of an Undeveloped 40-deg Sweptback Semispan Wing of Aspect Ratio 1.55 Equipped with Vortex 25-percent Chord Plain Airfoils (TN 2365)**—by Harold S. Johnson and John R. Hager

This report is one of a group prepared as part of the NACA's extensive investigation of lift and control effectiveness of various kinds of flaps and can-

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trial includes air transonic and supersonic wing planforms.

Rolling moment, yawing moment and adverse longitudinal data were obtained for the test wing through an airfoil deflection range between -10 deg to +30 deg at constant angles of attack.

Test results indicated that adverse effectiveness remained as the airfoil span increased, and that a partial-span skewer was most effective when located outboard on the wing inboard. Drag-increase coefficient change with angle of attack and with airfoil deflection at low angles was only slightly affected by airfoil span.

Representative results showed satisfactory agreement with existing empirical methods for determining adverse effectiveness and longitudinal parameters.

—DAA

► **The Effect of Mass Distribution on the Low-Speed Dynamic Lateral Stability and Control Characteristics of a Model with a Flexible Sweptback Wing** (TN 2313)—by Donald E. Hveem.

Mass distribution is one of the important parameters in the dynamic rise of airplane stability and control. Recently, enough general data have been available to enable designers to take mass-distribution changes into account. Now, recent trends in air-

craft design and parameters in the range of mass distribution parameters have made it necessary to extend earlier data.

This investigation was conducted in the Langley low-speed tunnel with a model having a combination of air dynamic parameters typical of present day aircraft. The model had a 45-deg sweptback wing in aspect ratio of 4, a taper ratio of 0.6 and a vertical tail having an area 3 percent of the wing area.

Yawing and rolling moments of inertia were systematically varied, but the total weight was held constant. For this particular model, NACA reported:

- Damping of lateral oscillation increased slightly with increased yawing moment of inertia, and decreased with increased rolling moment of inertia.
- Increases in rolling and yawing moments of inertia decreased the response of the model to lateral controls.
- Increases in yawing moment of inertia caused an increase in rudder travel relative to the adverse yaw (roll) required for smoothly coordinated maneuvers but increased in rolling moment at inertia caused a decrease in the required rudder travel.
- Control flight behavior worsened in rolling and yawing moments of inertia were increased.
- Fully good agreement was obtained

between trends predicted by theory and those obtained from model flight tests.

—DAA

► **Generalization of Boundary-Layer Momentum-Integral Equations to Three-Dimensional Flow Involving Those of Rotating Systems** (TN 2310)—by Arter Mages.

Recognizing the importance of flow over the boundary of three-dimensional boundary layer flow, NACA conducted a program of research directed towards a mathematical analysis of the problem. Beginning with the Navier-Stokes equations of motion and the equation of continuity, a transformation to orthogonal coordinates was performed. The coordinate system was considered to be rotating with a uniform angular velocity around an arbitrary axis in space.

By simplifying and integrating, basic layer momentum integral equations were developed which are applicable to either rotating or nonrotating flow boundaries.

These equations were further simplified, and an approximate solution was obtained for a generalized boundary layer momentum law thickness and flow deflection at the wall for turbulent flow. Comparison between a numerical analysis for use application of these simplified equations with test results

obtained in a curved, nonrotating duct showed fair quantitative agreement.

Equations are presented in a form which makes them readily adaptable to cases of steady, three-dimensional, incompressible boundary layer flow. This would include, for example, curved ducts, curved wings, turbomachinery, propellers and helicopter blades.

—DAA

► **Flight Investigation of the Variation of Static-Pressure Error of a Static-Pressure Tube with Distance Ahead of a Wing and a Fining** (TN 2311)—by William Gracy and Elwood F. Schell.

Positioning of the static-pressure source is one of the major problems in instrumenting an aircraft for research flight testing. At subsonic speeds, one satisfactory position is ahead of the wingtip, but the same may, and also for transonic and supersonic speeds, a position ahead of the leading edge is a possibly more satisfactory.

With either one, the problem involves itself into determining the location of the static source with respect to the wing or nose in order to keep the pressure error within specified limits. NACA conducted a flight investigation to check the variation of static-pressure errors against lift coefficient. Two airplanes were used as one the static pressure source was located ahead

of the nose, in the other, ahead of the tip.

It was found that for a wingtip static source, the error decreased as the distance from the leading edge increased, when the airplane was in the low-lift coefficient range. Near maximum lift coefficient, however, the error at the wingtip-mounted source was about the same for all practical distances ahead of the wing.

With fining installations, static-pressure errors are reduced, though the error decreases with distance from the fining.

—DAA

► **Strength of Hot-Resistant Laminates up to 375 deg C.** (TN 2316)—by E. M. Arnold and Martha A. Sherman.

Nonmetallic laminates of structural glass-fiber laminates at elevated temperatures are of interest to aircraft and missile designers because of the advantageous properties these materials possess for such applications as radomes.

The present investigation was begun at NBS to determine flexural properties of various laminates. Manufacturers and limitations were asked to submit samples for testing. Their responses included glass fiber laminates bonded with epoxies, phenolics, melamines, acrylic and unsaturated polyester resin.

This report summarizes results of flexural tests made at room temperatures after prolonged heating and also at elevated temperatures after heat and prolonged heating. Considerable design data is devoted to equipment and procedures which were especially developed for the project.

—DAA

► **Charts for Estimation of Longitudinal-Stability Derivatives for a Helicopter** (TN 2317)—by Kenneth B. Aker and F. B. Gustafson.

These charts provide a means for obtaining derivatives of rotor resistance forces, rotor pitching moment about the helicopter c.g., and rotor torque with respect to rotor angle of attack, forward speed, rotor speed and collective pitch.

Although the analysis is developed for unswept, untapered blades with flap-ping hinges at the rotor shaft, it can be applied to blades with normal values of taper and twist without serious error. Minor are indicated for getting individual terms necessary to apply the charts to rotors having flap-ping-large offsets.

These charts do not rely on the frequently used assumption that rotor resistance forces vector is perpendicular to tip path plane; this assumption is shown to hold in large measure in the longitudinal stability derivatives.

—DAA



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FINANCIAL

PAA Report Omits Mail Estimate

Carrier drops practice of including with income its own projection of as-yet-unauthorized postal pay.

For *American World Airways*, as in posting its 1970 results, has abandoned its practice of including in its income accounts any estimate of additional mail pay it believes forthcoming over and above the treasury rates which are now in effect.

This is a significant change to financial policy and should serve to remove a major difference checked at the company for its past contents of bolstering revenues and income by amounts projected by the management as due in mail pay but not yet authorized by Civil Aeronautics Board action. For *American* had been the only U.S. air carrier to report its income on this basis.

It was probably encouraged to do so by the absence of previous mail rates extending over a period of several years.

► **High Income**—Without any estimated additional mail pay, *Pan American* for 1970 shows net earnings after \$2,000,000 in federal income taxes, of \$4,664,464. This is equivalent to 66 cents a common share. For 1969, the company revealed net income of \$2,494,306, or 41 cents per share. During 1969, however, the company included \$1,947,000 in net estimated additional mail revenue.

If the company's past practice of including projected supplementary mail pay is carried across year continued for 1970, gross revenues would have been augmented by \$7,812,610, for a revenue of \$2,616,916. After a further tax provision of \$2,194,064, net income for 1970 would have been increased by \$1,826,899 to a total of \$7,994,365, or \$1.15 per share.

On the other hand, 1970 net earnings, as reported, includes non-operating income of \$1,615,800, after federal taxes, resulting from the profit on the sale of equipment.

Mail pay, nevertheless, continues to play an important part in *Pan American's* past, present, and future income considerations. The company continues with treasury rates in effect extending over a period of years. Until permanent rates are established by CAB, a license note and major qualification is attached to the company's past and present earnings reports. Treasury rates apply to the Pacific service from Nov.

16, 1945, to Alaska and Atlantic services from Jan. 1, 1946 and to Latin American operations from Apr. 1, 1945 to the present.

Beginning in the company's balance sheet accounts are the projected additional mail pay for periods prior to Dec. 31, 1944. The estimated amount of additional mail pay is carried at \$11,457,359 net. This related estimated tax liability and interest is placed at \$4,640,080 and is included among deferred credits. These accounts will be cleared only when permanent mail rates are established by the Civil Aeronautics Board.

► **Claim on AOA Mail Pay**—A significant side question is subject to the purchase of American Overseas Airlines, Inc. for \$37,618,000 last year. *Pan American* is making claim for such additional mail pay as may ultimately be awarded AOA in a permanent rate determination for the period from Jan. 1, 1946, to Sept. 25, 1970, when the company control operations. Obviously any such recovery would serve to reduce the purchase price paid by *Pan American*. Among the assets of AOA previously acquired were eight Boeing 747s, seven Constellation, and three DC-4s, together with related spare parts.

Pan American established a new peak in passenger travel during 1970 by a gain of 5.5 percent in average passenger miles to a total of 1.26 billion. Cargo also increased to a new high of \$1.7 million lb., up some 15.6 percent over 1969. This increased income was handled with a decrease of 14.5 percent in revenue plane miles flown by the carrier.

An improvement in the company's balance sheet was also accomplished during 1970. Net working capital amounted to \$22,194,000 of the 1970 year-end compared with \$23,068,600 a year earlier.

► **Debt Reduction**—While debt increased during 1970, it has been reduced in 1971. For example, at Dec. 31, 1948, total bank borrowings amounted to \$40 million. To facilitate the AOA acquisition in September, 1970, bank borrowings reached a peak of \$59 million. This was reduced by \$12,550,000 on Oct. 1, 1970, and by another \$6,773,000 payment on April 1, 1971, leaving the current amount

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outstanding at \$46,000,000. Further payments of \$6,250,000 each are due on Oct. 1, 1991, Mar. 31 and Sept. 30, 1992.

Additional payments of varying amounts are due semiannually through Sept. 30, 1993, when the loan is scheduled to be liquidated.

At Dec. 31, 1990, Pan American had commitments aggregating \$18 million for acquisition of 16 DC-60s. An advance payment of \$450,000 was made in 1979.

During the present year, \$6,250,000 will be required to pay for current deliveries with the balance presumably due in 1992 when all planes on order will be delivered. Other commitments of the company aggregated \$5 million at the 1990 year-end. Total depreciation charges amounted to more than \$17.6 million last year and should continue at the same rate during 1991. That should permit the company to accumulate sufficient cash not only to meet its current capital commitments but to make further reductions in its debt.

► **Dividend Ratio High.** Pan American continues to pay out a very high percentage of reported earnings in the form of dividends. During 1990, a total of 79 cents per share, or about 76 percent of retained earnings, were distributed to stockholders. In 1989, 23 cents per share, or 61 percent, out of the reported 31 cents per share of earnings was disbursed as dividends. That is the highest dividend payment in relation to available earnings which was reported among the airlines for the past two years.

While the company notes that its long-term real payments are subject to automatic adjustment up or down when CAR fees fluctuate, since, it is likely that the net effect of any such revisions will be upward. That simple means that past earnings could appear to have been understated. Further, on that basis, dividends, in retrospect, may be lower in relationship to available earnings.

The accountant had, however, points that are associated in mail returned for past periods will simply serve to bolster the company's financial position.

Pan American strongly endorses the principle of acquisition of mail pay from itself. It also drives outstanding current payments for mail carried at rates agreed upon by the Universal Postal Union. It is contended that such mail payments, together with those established under bilateral rates set by the CAR and, presumably containing an element of subsidy, would permit the company to compete on equal terms with other foreign international airlines.

—Selig Akshof



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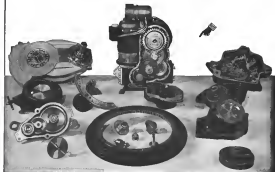
And we've had the satisfaction of watching Western's passenger traffic grow and grow, until it made an all-time record in 1990, after outstripping all other major airlines in its rate of growth over 1989.



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NEW AVIATION PRODUCTS



Vibration Mounts

Shock and vibration mounts designed to protect sensitive equipment and efficiently isolate vibrations are being manufactured by T. R. Foss & Co., Inc.

Called "Flexor" mounting brackets, the units feature "elastic" shock absorbers dampening which prevents excessive movement at resonant frequencies, the company says. They come in a range of sizes designed to mount aircraft, radio, radar and other electronic equipment weighing from 6 to 50 lb. in weight. The mounts are ruggedly designed, meeting Army-Navy E-14 drop test requirements, the company reports. They are designed to exact dimensions and meet requirements of Specification JAN C-172A. They operate in temperature range from -80 to 250 F. Address: 515 Jackson Ave., Broomfield, N.Y.



Lightweight Nuts

Elaborate Stop Nut Corp. reports it has developed a series of wing channel nuts 30 percent lighter and smaller nuts 25 percent lighter in weight than similar fasteners now commonly used.

These nuts feature the same high strength of previous designs, but have been trimmed down metal-wise, says the company. Produced in accordance with Specification AN-306, the lightweight nuts have the same overall envelope dimensions and can replace their heavier predecessors.

They carry the characteristic ESNB and elastic locking collar designed to insure accessibility, keep bolt and nut threads free of rust, and seal against liquid seepage. The company supplies the new wing channel nuts already mentioned in lengths, 248-74 channels, like standard for easy identification. Address: 2350 Ventnor Rd., Union, N.J.

Bonding Primer

A new primer liquid, which permits bonding of silicone rubber to many different types of materials and affords a combination of high strength, has been developed by the Chemical department of General Electric Co., Pittsfield, Mass.

The primer enables possible development of a wide variety of high performance new silicone rubber-to-metal bonded products. Among these would be improved shock and engine mountings for use in high and low temperatures, according to GE.

The liquid, designated GE 83267, can be used to bond silicone rubber to steel, titanium, glass, tin, copper and aluminum. In capacity, it now enables to develop a bond strength greater than strength of the rubber at any stage of the cure, it is underscored by the company.

As a measure of the primer's effectiveness, the firm points to its use in bonding GE 81125 silicone rubber to steel. In this case, a shear strength of 780 lb./sq. in. has been attained.

Here a few parts are bonded with the new liquid. After all dirt and grease is removed from metal or organic surfaces, the primer is applied by dipping and drawing, or by spraying or brushing. After application, parts ordinarily are dried about 30 min., then treated with water and dried again. Finally, the primed surface is molded under pressure at 115 C. to freshen, high-strength silicone rubber composed for 30 to 38 min. The bonded part then can be removed from the mold, generally, while it is still hot.

Jet Vacuum Cleaner

A vacuum cleaner designed expressly to meet aircraft production and maintenance requirements is being marketed by Electronic Products, Elwood.

The cleaner is built with an eye on simplicity and safety. It has no rotating parts and requires only connection to a standard compressed air line for operation. Five basic units, guaranteed, with no electrical components are used in the device.

The cleaner has double action. Operation of one fingertip control produces a vibrating jet of air to dislodge dirt and loose particles to hand to separate plate. A second control can be switched on to suck up these particles by suction.

For convenience, the dust container can be carried on the operator's back by means of a belt and harness assembly. Maintenance is simplified by use

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operates Panam flights over that route under a "through flight" agreement.

PAA says the agreement gives it complete control over Panam's planes while those operated with and from Miami, PAA now has no agreement to interchange with NAL. And PAA says Panam has no right to enter its planes turned over to NAL in Miami. Given the position that Panam can do what it wishes with its own planes.

NAL asked the Board to approve an interchange with Panam, and Panam President Shua asked the same thing—differently, says PAA because it wants a precedent of Panam doing so have such power.

Shua, however, says he is president of Panam and back he has every right to act in the airline's name. In effect, he asked CAB to enter an interchange between NAL and Panam even though there was not a valid interchange agreement between the two carriers.

■ **CAB Study**—As part of the order that led to the granting of tentative approval of the NAL-Panam interchange, CAB authorized an aerial study of service to South America, part of which is to determine whether PAA flight is compelled to interchange with National to provide the New York-Miami link.

PAA has always felt that its interchange for the New York-Miami service should be with Eastern. It tried to make a deal with EAL years ago and failed. It took NAL as second best. At the time, NAL wasn't as much of a position to agree.

When NAL requested the stock agreement, PAA felt it was just too cheap, and left leaving much to an interchange agreement with EAL. That agreement allows for later participation

by Panam, which PAA has urged. Given also probably would like Panam to be into EAL's routes, but the EAL interchange has only started though CAB's deal would be a pair or more in the near future.

■ **Court Thwart**—CAB approval of compulsory PAA-NAL interchange would impose PAA's deal with Eastern. So PAA, even at this early stage, is threatening court procedure.

Eastern, also, probably will try court action to reverse CAB if the present plan was made permanent. For if PAA and Panam get both made to tie up with NAL, Eastern would have a dead end at Miami for much of its traffic. All traffic to South America—east coast or west coast—might move over National.

CAB recognized this threat to EAL and said it would consider the possibility of extending Eastern to Havana, where it could connect with Brazil's South American carrier or extend from all three through to Miami. Keep at that, EAL would prefer it would be looking only one of the three South American carriers, an agent NAL's two.

Brazil, possibly, stands to benefit most out of such an arrangement this service, that it would be getting traffic from the biggest carrier, where now it gets it possibly from NAL. But, it is not clear if a Brazil in EAL sales and subsequent interchange is in the future.

Meanwhile, Brazil's sole airway to the U.S. East Coast would be severed by the Panam-NAL interchange.

■ **Don Give Control**—In the debate at its interim with EAL, Pan American has asked CAB once again to look into whether GAO controls National, Eastern probably will join in that

action. At issue, according to PAA and EAL, is whether a "national company" was created an airline. CAB once before, in the American Export Airlines case, decided it couldn't.

Given is mentioned about this problem. For once being, CAB already has taken up that question, and hasn't yet acted on it. For another, GAO claims it is not a ownership issue, but an "international national trading and transportation company." It is a variety of enterprises of which the Coast Line is only one, although a main one. And then, GAO at several times only 17.4 percent of National's stock. Even then could give it control if the other shares were widely distributed, and PAA and EAL suspect that GAO associates own considerable stock close that 17.4 percent.

If that was true, CAB conceivably could order GAO to divert stock of most of its NAL holdings. That would put NAL back on the market. And a further possibility, though perhaps excluded, is that of a deal to be formed of the type of the type between PAA and GAO over Panam—as an airline important to national defense—and more in the past control which has at times immobilized Panam program.

An CAB study of the exchange to its interim approval of the NAL-Panam interchange, it will draw the clear conclusion that court action will follow if it thinks by its original ruling.

In addition to the complexity as part as they affect PAA, both PAA and EAL have pointed to what they say is a clear violation of the Administrative Procedure Act. According to the attorneys for the two carriers, that is in essence that when an executive has a case he must make a report before the Board can take final action. There was no executive's report on the overall letting of which the NAL-Panam interchange was a part.

Mission Helps Build Bolivia Facilities

A CAA airport engineering mission is helping Bolivia build the longest runway in the world at the highest airport in the world. La Paz, elevation 11,400 ft. Runway will be 16,000 ft long.

Says CAA Bolivia mission chief Pedro Vigne "As in Alaska, the construction of roads generally will prove too expensive, and the airplane is being accepted gladly and its use vigorously developed by the government."

CAA is using U.S. construction equipment systems to design infrastructure, such as roads, by using the piece transfer and direct, or making it demonstrable.

1950 Safety Record

Traffic on U.S. scheduled domestic lines last year was the safest ever—about twice as safe as on U.S. scheduled international carriers, and 10 times as safe as on domestic lines, the safety rate was 1 per 100 million passenger miles. For the international carriers it was 2 1/2.

Year	Passenger Miles	Domestic Carriers	International Carriers	Passenger Miles	Domestic Carriers	International Carriers
1949	1,000	1.0	1.0	1,000	1.0	1.0
1950	1,000	1.0	1.0	1,000	1.0	1.0
1951	1,000	1.0	1.0	1,000	1.0	1.0
1952	1,000	1.0	1.0	1,000	1.0	1.0
1953	1,000	1.0	1.0	1,000	1.0	1.0
1954	1,000	1.0	1.0	1,000	1.0	1.0
1955	1,000	1.0	1.0	1,000	1.0	1.0
1956	1,000	1.0	1.0	1,000	1.0	1.0
1957	1,000	1.0	1.0	1,000	1.0	1.0
1958	1,000	1.0	1.0	1,000	1.0	1.0
1959	1,000	1.0	1.0	1,000	1.0	1.0
1960	1,000	1.0	1.0	1,000	1.0	1.0
1961	1,000	1.0	1.0	1,000	1.0	1.0
1962	1,000	1.0	1.0	1,000	1.0	1.0
1963	1,000	1.0	1.0	1,000	1.0	1.0
1964	1,000	1.0	1.0	1,000	1.0	1.0
1965	1,000	1.0	1.0	1,000	1.0	1.0
1966	1,000	1.0	1.0	1,000	1.0	1.0
1967	1,000	1.0	1.0	1,000	1.0	1.0
1968	1,000	1.0	1.0	1,000	1.0	1.0
1969	1,000	1.0	1.0	1,000	1.0	1.0
1970	1,000	1.0	1.0	1,000	1.0	1.0
1971	1,000	1.0	1.0	1,000	1.0	1.0
1972	1,000	1.0	1.0	1,000	1.0	1.0
1973	1,000	1.0	1.0	1,000	1.0	1.0
1974	1,000	1.0	1.0	1,000	1.0	1.0
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1982	1,000	1.0	1.0	1,000	1.0	1.0
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1984	1,000	1.0	1.0	1,000	1.0	1.0
1985	1,000	1.0	1.0	1,000	1.0	1.0
1986	1,000	1.0	1.0	1,000	1.0	1.0
1987	1,000	1.0	1.0	1,000	1.0	1.0
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2001	1,000	1.0	1.0	1,000	1.0	1.0
2002	1,000	1.0	1.0	1,000	1.0	1.0
2003	1,000	1.0	1.0	1,000	1.0	1.0
2004	1,000	1.0	1.0	1,000	1.0	1.0
2005	1,000	1.0	1.0	1,000	1.0	1.0
2006	1,000	1.0	1.0	1,000	1.0	1.0
2007	1,000	1.0	1.0	1,000	1.0	1.0
2008	1,000	1.0	1.0	1,000	1.0	1.0
2009	1,000	1.0	1.0	1,000	1.0	1.0
2010	1,000	1.0	1.0	1,000	1.0	1.0
2011	1,000	1.0	1.0	1,000	1.0	1.0
2012	1,000	1.0	1.0	1,000	1.0	1.0
2013	1,000	1.0	1.0	1,000	1.0	1.0
2014	1,000	1.0	1.0	1,000	1.0	1.0
2015	1,000	1.0	1.0	1,000	1.0	1.0
2016	1,000	1.0	1.0	1,000	1.0	1.0
2017	1,000	1.0	1.0	1,000	1.0	1.0
2018	1,000	1.0	1.0	1,000	1.0	1.0
2019	1,000	1.0	1.0	1,000	1.0	1.0
2020	1,000	1.0	1.0	1,000	1.0	1.0
2021	1,000	1.0	1.0	1,000	1.0	1.0
2022	1,000	1.0	1.0	1,000	1.0	1.0
2023	1,000	1.0	1.0	1,000	1.0	1.0
2024	1,000	1.0	1.0	1,000	1.0	1.0
2025	1,000	1.0	1.0	1,000	1.0	1.0
2026	1,000	1.0	1.0	1,000	1.0	1.0
2027	1,000	1.0	1.0	1,000	1.0	1.0
2028	1,000	1.0	1.0	1,000	1.0	1.0
2029	1,000	1.0	1.0	1,000	1.0	1.0
2030	1,000	1.0	1.0	1,000	1.0	1.0
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2038	1,000	1.0	1.0	1,000	1.0	1.0
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2058	1,000	1.0	1.0	1,000	1.0	1.0
2059	1,000	1.0	1.0	1,000	1.0	1.0
2060	1,000	1.0	1.0	1,000	1.0	1.0
2061	1,000	1.0	1.0	1,000	1.0	1.0
2062	1,000	1.0	1.0	1,000	1.0	1.0
2063	1,000	1.0	1.0	1,000	1.0	1.0
2064	1,000	1.0	1.0	1,000	1.0	1.0
2065	1,000	1.0	1.0	1,000	1.0	1.0
2066	1,000	1.0	1.0	1,000	1.0	1.0
2067	1,000	1.0	1.0	1,000	1.0	1.0
2068	1,000	1.0	1.0	1,000	1.0	1.0
2069	1,000	1.0	1.0	1,000	1.0	1.0
2070	1,000	1.0	1.0	1,000	1.0	1.0
2071	1,000	1.0	1.0	1,000	1.0	1.0
2072	1,000	1.0	1.0	1,000	1.0	1.0
2073	1,000	1.0	1.0	1,000	1.0	1.0
2074	1,000	1.0	1.0	1,000	1.0	1.0
2075	1,000	1.0	1.0	1,000	1.0	1.0
2076	1,000	1.0	1.0	1,000	1.0	1.0
2077	1,000	1.0	1.0	1,000	1.0	1.0
2078	1,000	1.0	1.0	1,000	1.0	1.0
2079	1,000	1.0	1.0	1,000	1.0	1.0
2080	1,000	1.0	1.0	1,000	1.0	1.0
2081	1,000	1.0	1.0	1,000	1.0	1.0
2082	1,000	1.0	1.0	1,000	1.0	1.0
2083	1,000	1.0	1.0	1,000	1.0	1.0
2084	1,000	1.0	1.0	1,000	1.0	1.0
2085	1,000	1.0	1.0	1,000	1.0	1.0
2086	1,000	1.0	1.0	1,000	1.0	1.0
2087	1,000	1.0	1.0	1,000	1.0	1.0
2088	1,000	1.0	1.0	1,000	1.0	1.0
2089	1,000	1.0	1.0	1,000	1.0	1.0
2090	1,000	1.0	1.0	1,000	1.0	1.0
2091	1,000	1.0	1.0	1,000	1.0	1.0
2092	1,000	1.0	1.0	1,000	1.0	1.0
2093	1,000	1.0	1.0	1,000	1.0	1.0
2094	1,000	1.0	1.0	1,000	1.0	1.0
2095	1,000	1.0	1.0	1,000	1.0	1.0
2096	1,000	1.0	1.0	1,000	1.0	1.0
2097	1,000	1.0	1.0	1,000	1.0	1.0

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MATS Division Better Safety Mark

The safety record of Military Air Transport Service's Continental division improved since that one-fifth in 1950 over 1949. March, June, July and August were accident-free.

Since time as the accident rate improved, total flying hours increased more than one-third to over 150,000 hours flying hours.

Continental division flew over half the 185,000 hours on the Pacific route. These are three divisions of MATS.

Continental, Pacific, Atlantic. Continental division flies and covers its under Pacific division control when they fly the Pacific route to Tokyo.

Best safety record of the year was achieved by Navy Air Transport Squad No. Three, Moffett Field, Calif.—a component of MATS. It did not have a single major or minor aircraft accident in 1950. Another accident-free outfit in 1950 was the 1172nd Air Transport Squadron at Great Falls AFB, Mont. Its equivalent from C-54 pilots.

Standardization—Representatives of the three MATS divisions met recently to standardize operational procedures of the three divisions.

The standard transport operations (Manual 55-1) and the manual on operating instructions for C-47 aircraft (Manual 55-2) are being standardized.

Standardizing C-57 operations. A new C-47 crew now on 81 is an example of the three divisions' operations. Continental, Atlantic or Pacific without one training.

MATS is also planning to train a pair of transport operations specialists. They will be sent to the Korean area, MATS can send a Pacific route to the operation.

Rental Appoints 2 Commerce Aids

Delta Rental set up his new shop as Commerce Undersecretary Jim Thompson in a busy but work and moving right into air coordination planning and operation.

First met an appointment of Mr. Gen. Donald E. Connolly as special assistant for civil aviation mobilization. Connolly is now "supervising" the NSR Air Transport Mobilization Survey. That is, he is averaging steadily between plans for allocation and use of available planes, routes, airports, passenger facilities.

Meanwhile, Deputy Commerce Undersecretary for Transportation Philip Heller is working on aircraft production program and controlled materials allocation of the Defense Production Administration. Heller has been in on all

the aircraft production board tentative meetings this month.

Job Assignment—First Rental, has already departed the new chart of coordination. He is on his way to Connolly with wide civil aviation program experience, an facilities producing to Heller with industry and DPA experience. Among all three, Rental, Connolly and Heller as Connolly's League, Rental's executive assistant. Rental is on his way to Heller as Heller's chief, who has been his special assistant recently while he held other posts.

Donald Connolly recently to Rental's office from his job as director of Baltimore Dept. of Aviation. He is working with Heller on a balanced team, maintaining his work at Baltimore. In Technical, he is at Commerce in a 99-day period only, but while Heller was the period will be removed. Connolly's background—CAA administrator when he started in 1942 he became military director of U S civil aviation. Then he was commanding general of the Panama Canal Command of the Army for two years. After war he was directed largely property disposal division. He returned from the Army in March, 1945 and became Baltimore civil aviation director.

Deputy Undersecretary of Commerce for Transportation Philip Heller comes from James K. Hensley's Defense Transport Administration and the vice presidency of American Car & Foundry.

The past two weeks he has been working at the aircraft production board of DPA working to get commercial aircraft removed from the CDP production. This is at that CAA and the Maritime Board can handle controlled materials distribution, production scheduling and DPA priority issues (see story page 17).

SHORTLINES

Air Lines—Inch Airlines between these carried 9 percent more passengers in the first year ended May 31. Dallas-Los Angeles route got about half the 224,579 who traveled.

Air France—French government-owned airline has started carrying air service New York to Düsseldorf and Hamburg in less than 24 hours.

Air Transport—Atlantic Crossing House. Inquiries as of March were up 58 percent over 1950 to \$11,950,557. First-quarter business is up 57 percent to \$61,166,083.

Air American Airways—AAA headed

14,709 passengers the first quarter—57 percent over 1950.

BACA Airlines—Massachusetts airline carrier in its first year of scheduled single-engine local service has now placed 87 percent of scheduled flights BACA has asked the CAA to terminate its first stage and put a second 7. Raymond Brantley says BACA is up rating "slightly above the break-even point without benefit of need."

Colonial Airlines—Colonial will commence scheduled service on May 15.

El Al—Israeli National Airlines is having Lockheed Aircraft Service station at New York's Idle Air Constructions at Idle.

Northwest Airlines—NWA operating revenues the first quarter hit a record \$8,911,796—\$5,837,267 of domestic. Net loss for the period at \$1,610,400, but last year's was \$1,651,000, the company says. Despite somewhat higher revenues, outside capacity was actually lower than a year ago. Load factor alone raised revenues and cut net losses.

Pacific Northwest Airways—PNA has signed a "lease-purchase" contract with Pacific American Corp. to overhaul all of PNA's aircraft engines.

Reiser Airlines—Reiser on June 21 starts all-weather Caribbean from "A3-300" 35-300 6000-p. routes are \$498 from New York, \$445 from Miami, and \$466 from Washington. Center includes one week stops at Trinidad, Venezuela and Haiti.

Sabena—Belgian airline handled 7,990,143 lbs. cargo through Brussels in 1950, this is the key point on the Sabena system, and that percentage is almost all the last record. Breakdown on all cargo: 29 percent from England, 14 percent from France, 32 percent from Czechoslovakia, 8 percent from Italy and 6 percent from U. S., 11 percent to England, 9 percent to France, 6 percent to Italy, and 5 percent to U. S.

Seaboard & Western Airlines—International scheduled's first-quarter revenues were \$2,507,000, or 6,740,000 tons miles. Westbound traffic on the North Atlantic gained 79 percent.

Tamu World Airlines—CAL has denied TWA's request to serve both Santa Fe and Albuquerque on the same flight.

United Air Lines—UAL has started its transcontinental route, Seattle-Vancouver, using 28-passenger converted DC 15.

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WRIGHT
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Ten Years of the Jet Era

Last week, at the end of the past ten years, aviation engineers and executives were laying plans for the future based on the simple fact: the airplane at almost unlimited power in the jet engine. This work is the least successful of a new age of flight—the jet era—has been publicly announced and among because of wartime secrecy. Not until after the war were the basic outlines of its design disclosed. Even today there are few detailed accounts of such a significant event. This is how it was:

Late in the evening of May 15, 1941, a tiny, low-wing airplane, towed out to the end of the concrete runway at Cranwell, England. It passed for a moment, moving into the west wind, with its engine humming like the off-truck. And then a strong sound—a high-pitched whine which rose to a whistle and then to an almost unbearable shriek—cut through the steady roar and the little craft began to roll down the runway. It accelerated rapidly, and after about 2000 ft., it had gained into the darkness sky. It climbed slowly away from Cranwell, and the new noise of its engine, echoing from buildings and clouds and the rolling land, hoarse and muffled like a distant freight train.



This was the first flight of the Gloster-Whittle E.28/39 (illustrated) jet. The British jet-propelled aircraft and later carrier of a long line of successful turbojet planes.

► **The Beginning**—The effort commenced in that first flight began in March, 1935, when the British Air Ministry placed a development contract with Power Jets, Ltd., Sir Frank Whittle's firm. The first flight test, the W.1, was ordered on Feb. 1939. Shortly after, the Ministry began discussions with Gloster Aircraft Co. for the design and construction of a new fighter to test the engine.

The E.28/39 was originally planned as a low gas fighter, to be powered by a 1200-lb. static thrust engine, and to be capable of a 3500-mph. speed. Its wingspan was 28 ft. and its length, 35 ft. 3 in. It weighed in at 2740 lb.

Two were to be built, designed under the supervision of George Carter, Gloster's chief designer. Construction began

at the Gloster works at Broomborough, but because of the bombing danger was transferred to a garage at Chislehurst.

The first W.1 engine was drawn and built by Bristol's Thompson-Baker Co. Some of its parts were found to be non-flyable, and so the first engine to be installed—the W.1X—was untested and used only for testing tests.

The final W.1 engine had ten severe flow combustion chambers, fed by a double-sided centrifugal compressor. Kerosene was the fuel, and the exhaust gases turned a turbo-propeller, and a free turbine. At maximum permissible rpm—16,100—the W.1 was rated at 568-lb. static thrust.

► **First General Run**—F/L P. E. G. Sayer, Gloster's chief test pilot, was assigned to the experimental flight program, and early in April, 1941, began test runs on the grass field at Broomborough. During these runs, the E.28 actually was airborne for short distances at altitudes of about 5 ft.

Afterwards the W.1 engine was installed for flight tests. The plane was taken by road to Cranwell and further testing tests were made there on May 14, climaxed by the first flight the following morning.

Flight testing of the first prototype continued through 1941, and early in 1942, an improved engine—Power Jets W.2A—was installed for a second series of tests. Gloster pilots succeeded later—killed practicing attacks in a Hawker Typhoon—continued to tick off time as the prototype until it was handed over to the RAF at the end of 1943.

► **Second Original**—Second prototype flew in March, 1943, powered by a W.2B engine rated at 1000-lb. thrust. (The W.2B, incidentally, was the basis for the first American engine, the E.16, built by General Electric Co.) During flight trials, a speed of Mach .51 was reached.

An accident to this second prototype halted the experimental series over to the original one, which, as the machine, had been fitted with a Power Jets W.2A/30, rated at 1700-lb. thrust. This craft completed high-altitude flight tests, including, among its journey, one that topped 42,000 ft. The final ten hours of flight tests were completed at Farnborough early in 1944, and the little craft was retired from active duty.

It hangs now in the Science Museum in South Kensington, London. And there it is a popular monument to the technical power and courage of Sir Frank Whittle, George Carter, F/L Sayer and the other British engineers who, hampered by isolation and blindness, helped design and build the E.28/39. These men have changed the face of aviation.

—EJAA



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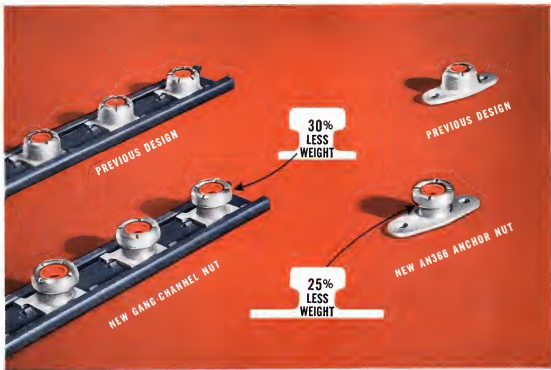
► Due to its electronic navigation, the Gyroplane prevents over-control, guides the ship with much less manual surface motion and saves what for an airship is virtually a disastrous course error so much time.

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matic pilot on the entire fleet of K-type airships operating out of the U. S. Naval Air Station at Lakehurst, N. J., the human pilots can devote more time to the somewhat tiring of coastal waters... to the accomplishment of missions consistent with accuracy.

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